Proposed BDCP Delta Inflow/Outflow Planning Principles

PRE/NGO Scenario Development

April 1, 2009

Objectives

- Explore a range of inflow/outflow objectives for consideration in BDCP planning
- Consider improved, simplified methods for providing Delta inflows/outflows that **balance** competing needs

Delta Outflow Complexities

- Changes to Delta outflow requirements affect the total water available for competing purposes – tradeoffs necessarily occur
  - Upstream environmental (i.e. coldwater pool)
  - Delta environmental (i.e. open water habitat, X2)
  - Water supply needs (i.e. exports)
- Spring outflow requirements occur at times of poor forecasting capability
- Only a fraction of the Delta outflow is manageable by the SWP and CVP facilities
- Outflow satisfaction can be achieved through changes in reservoir releases or exports
- Sharing of requirements between the SWP and CVP are based on previous in-basin uses
- Individual projects and reservoirs have varying degrees of direct, upstream obligations (flow, temperature, delivery requirements)

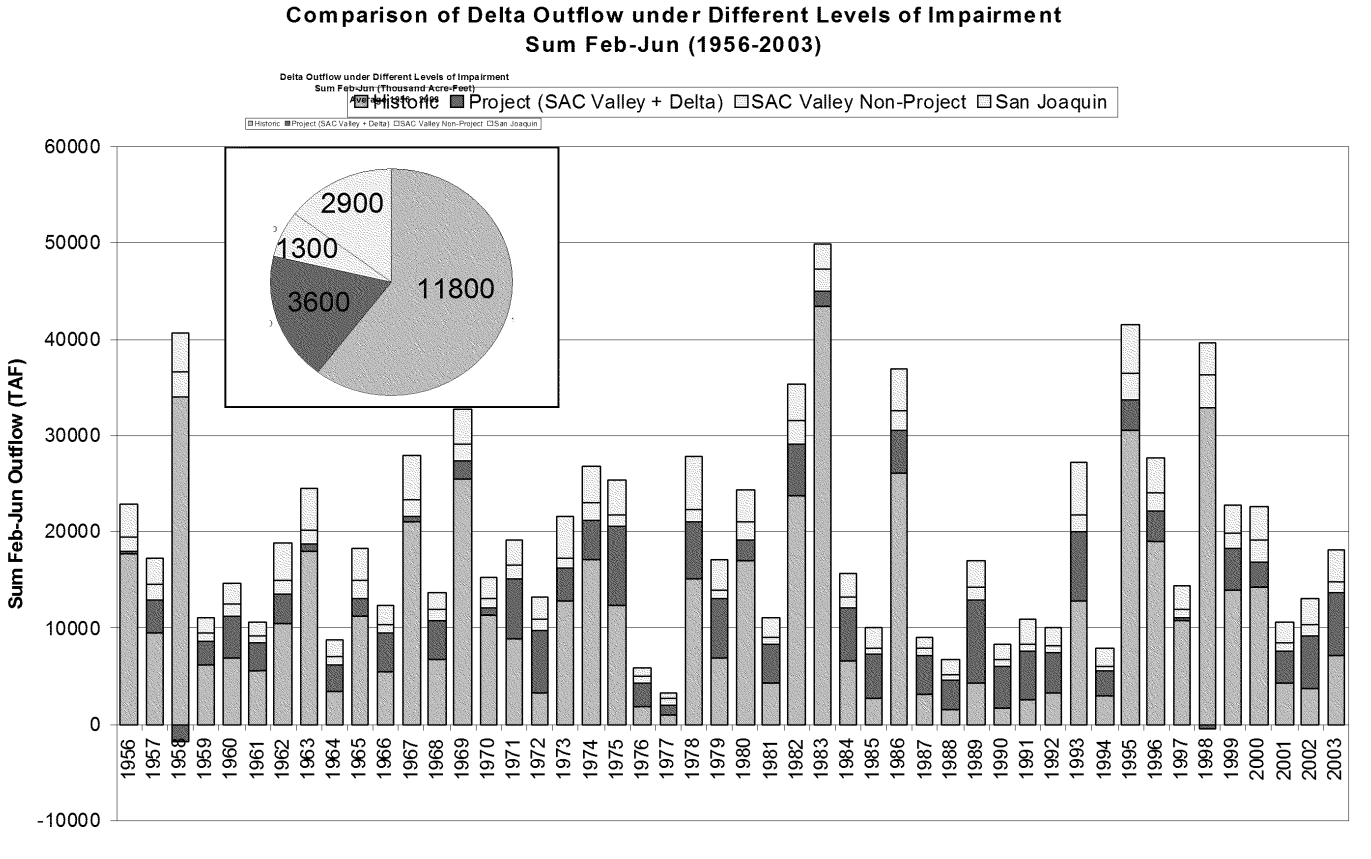
Development of Inflow/Outflow Planning Principles

- Inflow/Outflow targets based on best-available science
- Work with water volumes manageable by SWP and CVP in the Sacramento Valley
- Maintain synchrony with natural flows
- Protect upstream conditions
- Maintain X2 within region best-suited for estuarine function and primary productivity
- Utilize best available forecasts and risk principles for setting targets

1. Based on Best-Available Science

- Summary of best-available science (in-progress)
  - Inflows/Outflows provide environmental flow cues for salmonid migration
  - Synchrony of hydrology between Sacramento River and tributaries is important for fish migration and transport
  - Seasonal and inter-annual variation in outflow is important in determining the low salinity zone location to support estuarine trophic processes and habitat for covered species

2b. Work within Water Volumes Manageable by SWP and CVP in Sacramento Valley



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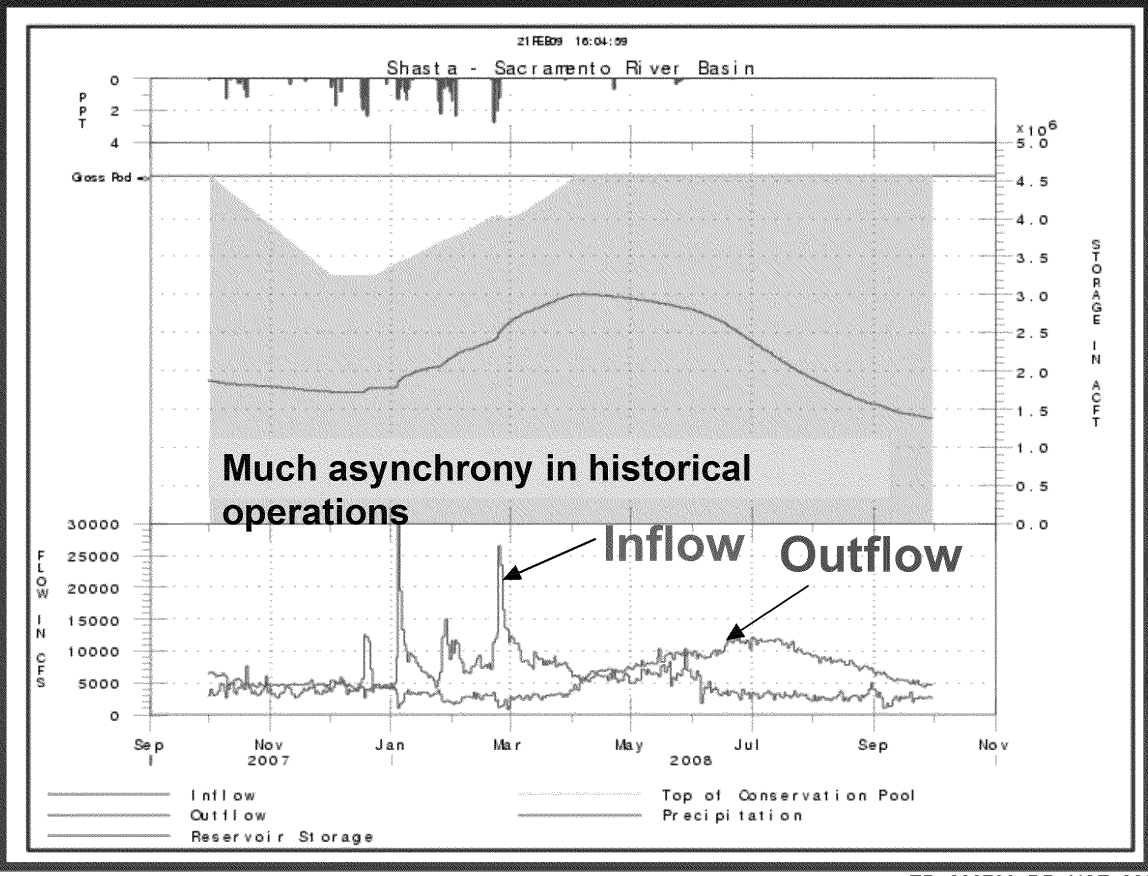
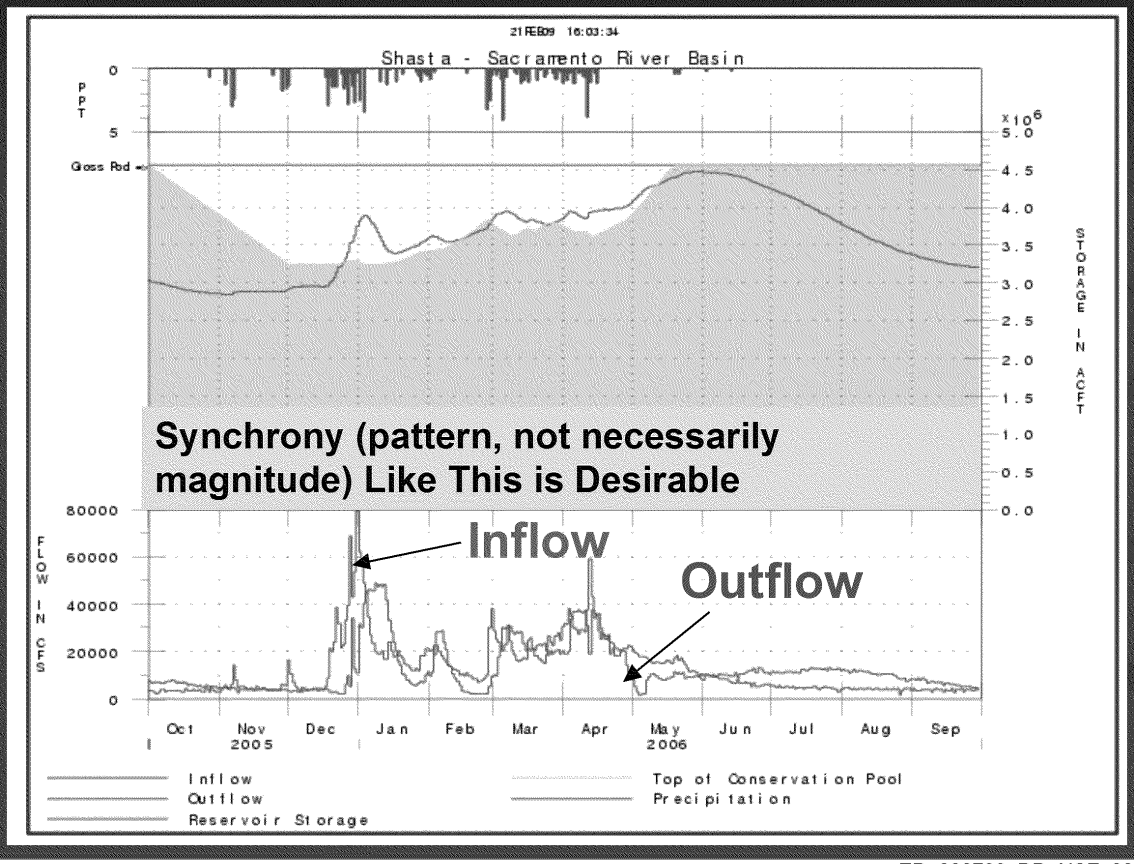
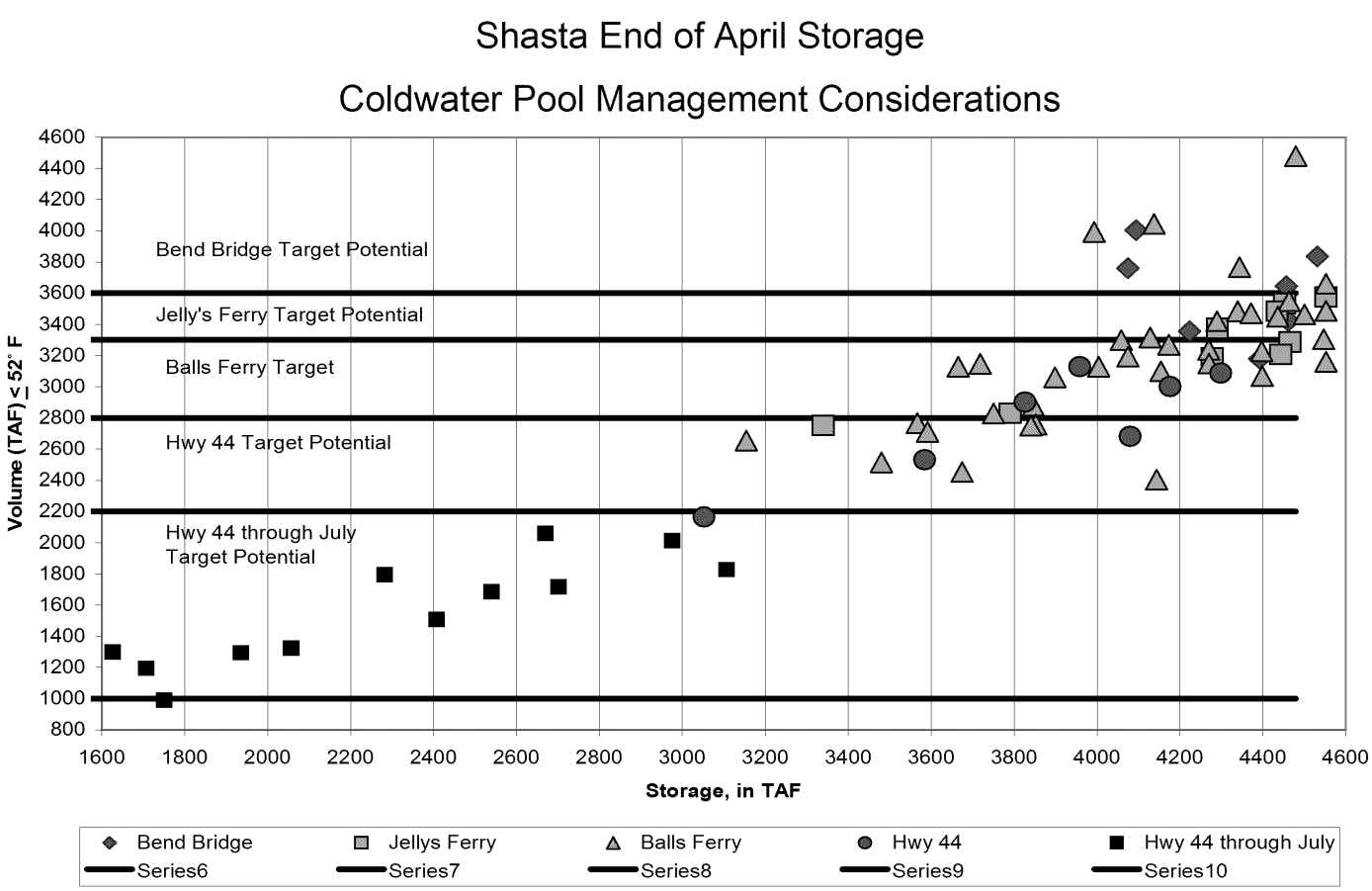
3a. Maintain Synchrony with Natural Hydrology



3b. Maintain Synchrony with Natural Hydrology



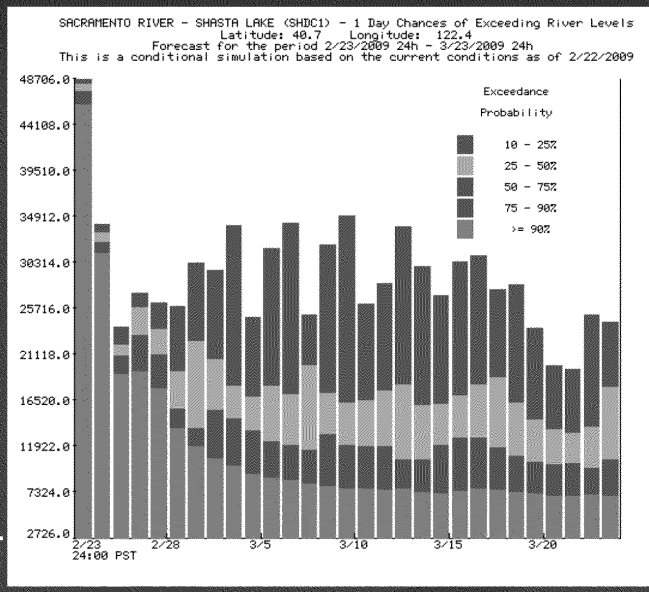
4. Protect Upstream Conditions



5. Maintain X2 within Region Best-Suited for Estuarine Function and Primary Productivity

6. Utilize Best-Available Forecasts and Risk Principles for Target Setting

- Utilize best-available forecasts
  - Bulletin 120 Seasonal forecasts
  - NWS CNRFC Monthly forecasts
  - AHPS and ESP (5-day to 14-day ensemble forecasts)
- Use risk levels consistent with water allocation and other regulatory standards
  - 90% exceedance levels for Jan-May
  - 50% exceedance levels for Jun



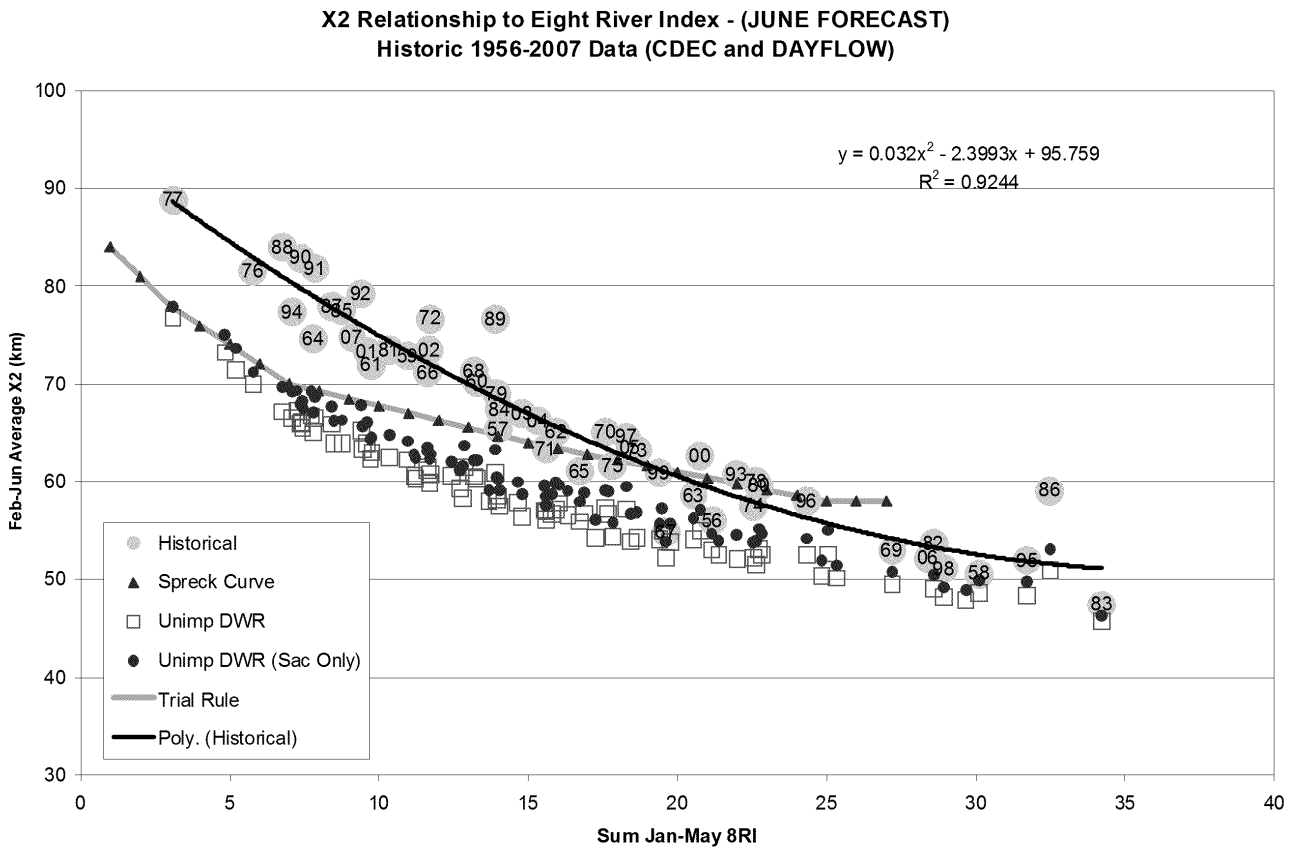
Source: NOAA, http://www.cnrfc.noaa.gov

Potential Inflow/Outflow Scenarios

- Outflows
  1. Outflow as function of unimpaired Sac Valley runoff ***and*** impaired San Joaquin Valley runoff
  2. TBI/NGO X2 proposal – X2 as function of 8 River Index
  3. D-1641 X2 standard without Roe Island triggering
- Inflows
  4. Sac R Inflow as function of unimpaired Sac Valley runoff
  5. Reservoir bypass flows as function of inflows

PRELIMINARY DRAFT—NOT FOR DISTRIBUTION

Representation of NGO X2 Proposal



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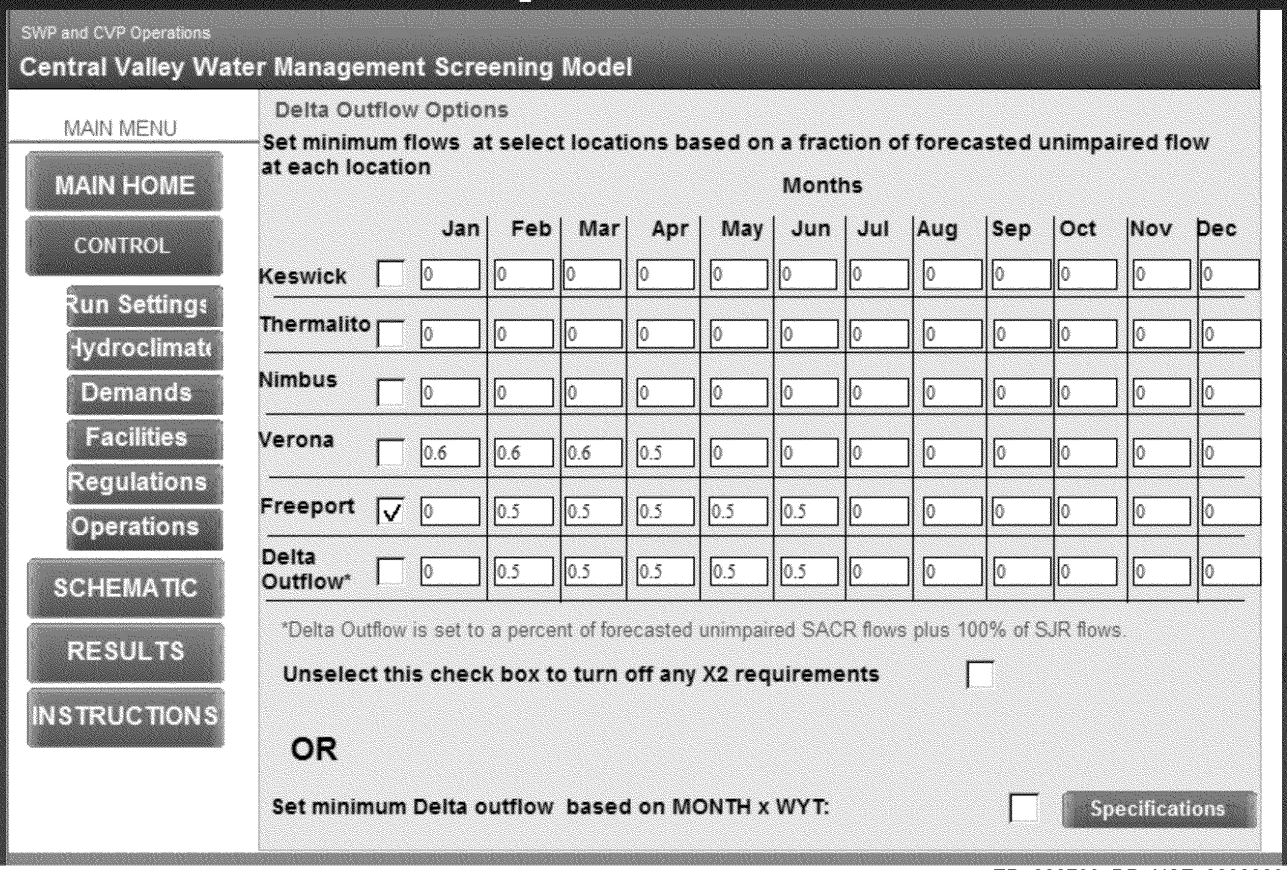
Outflow/Inflow Targets Based on Unimpaired Flows



Approach for Evaluating Varying Delta Outflow/Inflow Objectives

- Incremental approach to better understand system capabilities and impacts
- 3 legs to the stool: (1) Delta flows, (2) upstream coldwater storage, (3) water supply
- Pass 1
  - Demonstrate operation of upstream reservoirs under the assumptions that releases would only occur for upstream demands and requirements, Delta requirements, and exports only for Water Rights and Exchange contractors.
  - Not a realistic scenario, but would illustrate the capability of the system to satisfy the given Delta flow objective.
- Pass 2
  - Adds realism by including the delivery allocation decisions that would show the combined effect of operation of the projects for both water supply and environmental purposes.
  - Trade-offs between these deliveries, storage, and outflow can be ascertained by this simulation.

Key Modeling Metrics

- Export reliability
- Outflow
- X2
- Old and Middle River flow
- Sacramento River d/s of north Delta diversion
- Upstream storage (September and April)

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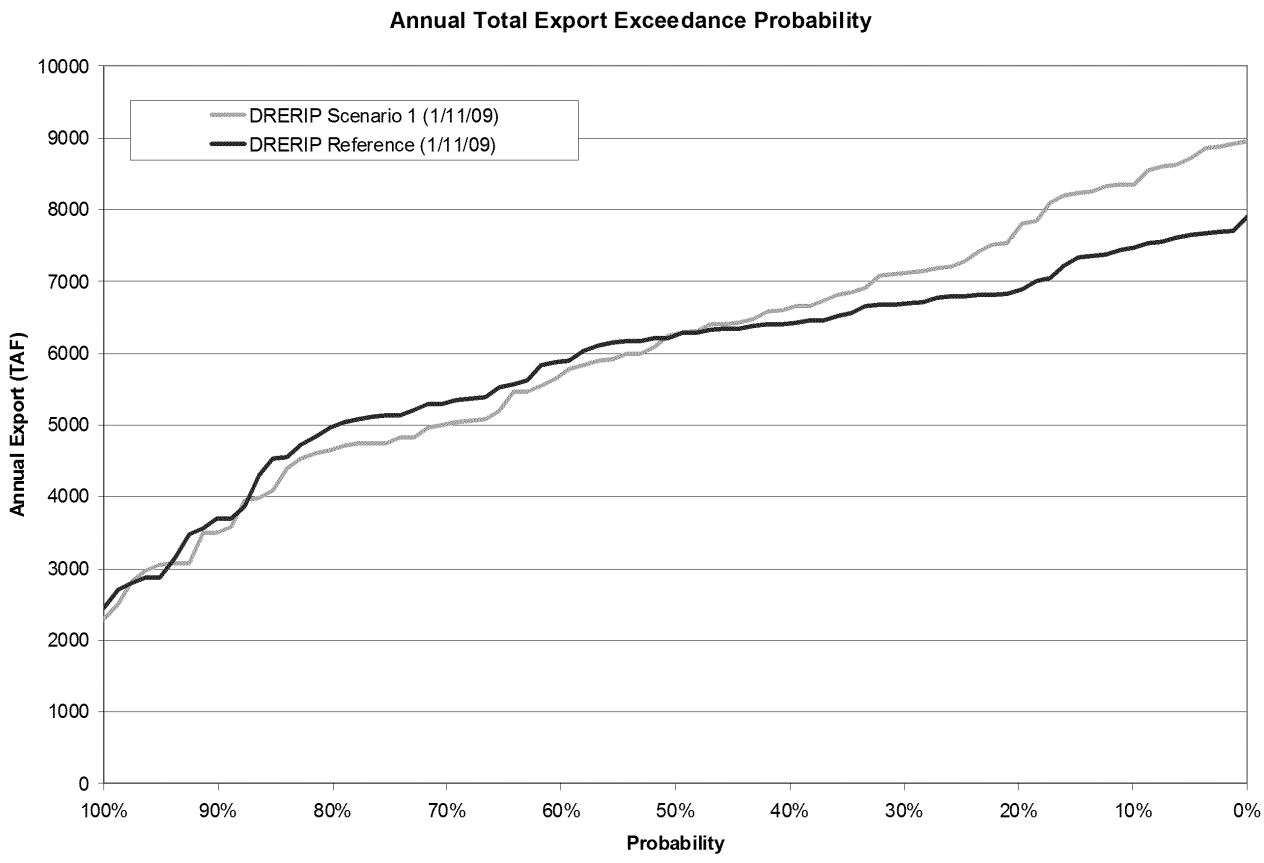
Export Reliability (Example only)



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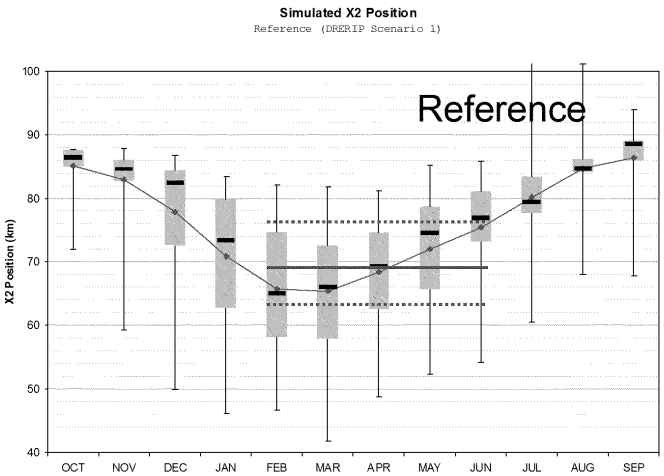
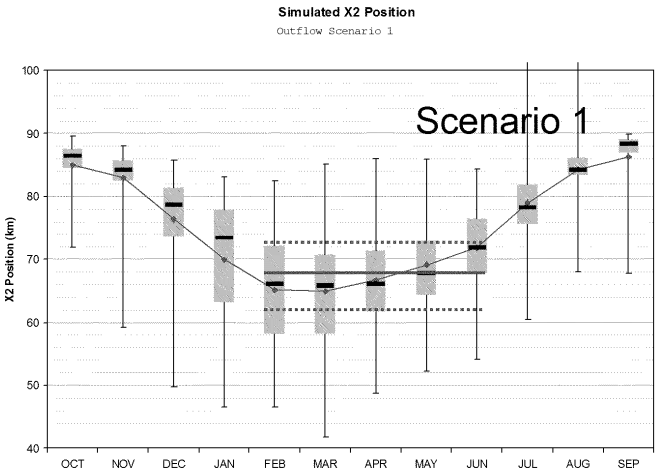
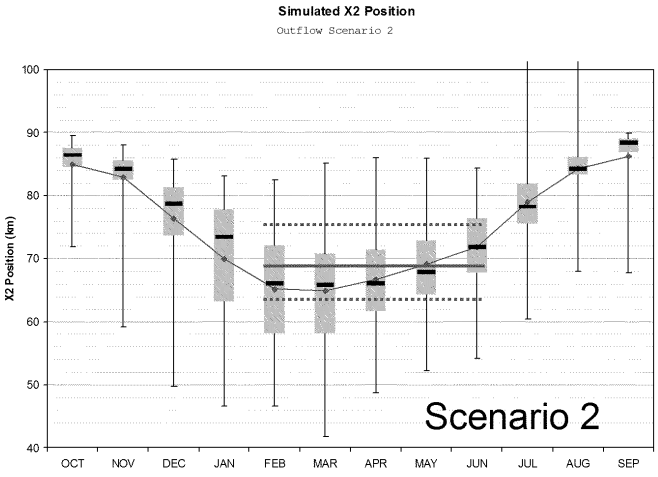
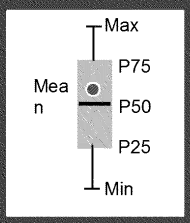
X2 Changes (Example only)









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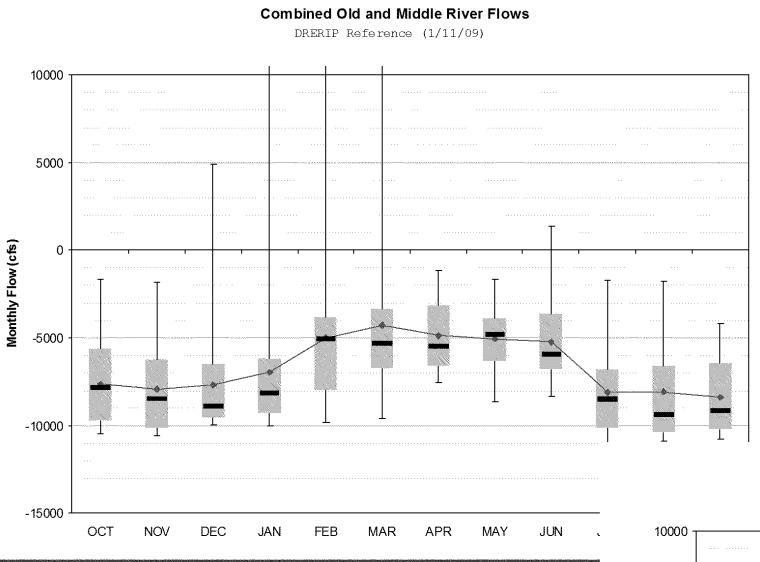
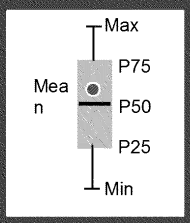
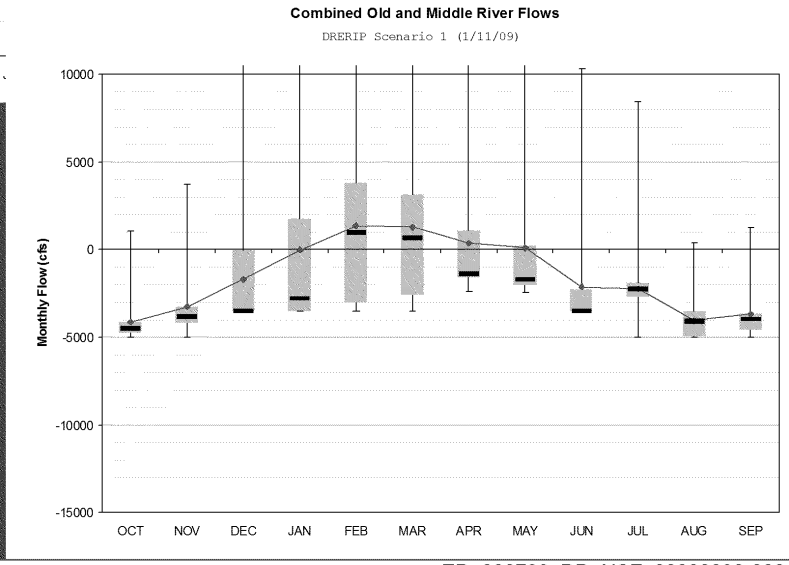
OMR Flows (Example only)







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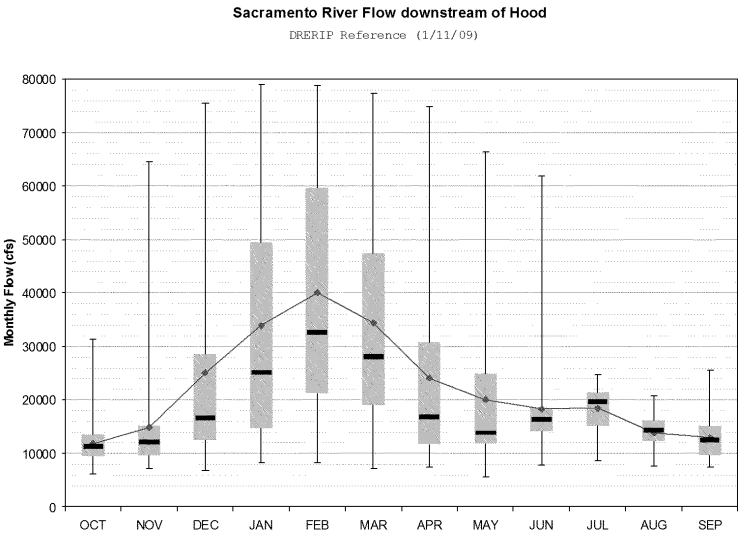
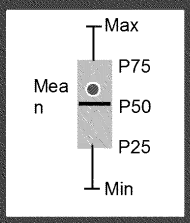
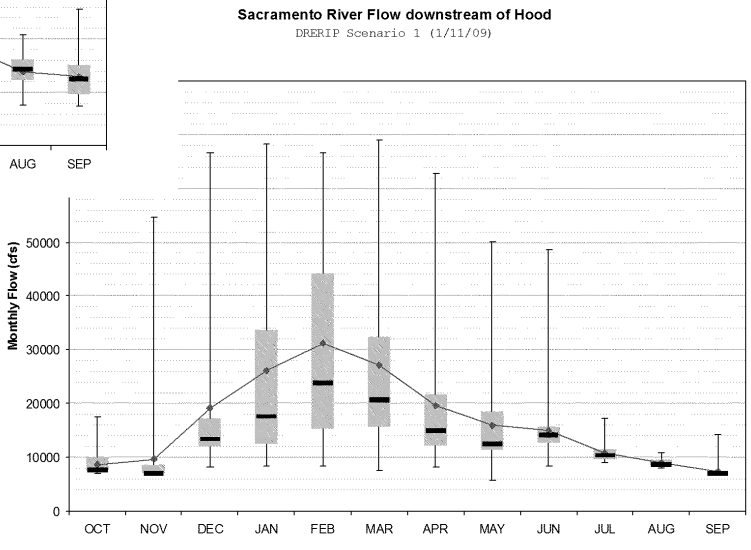
Sac River Flows (Example only)







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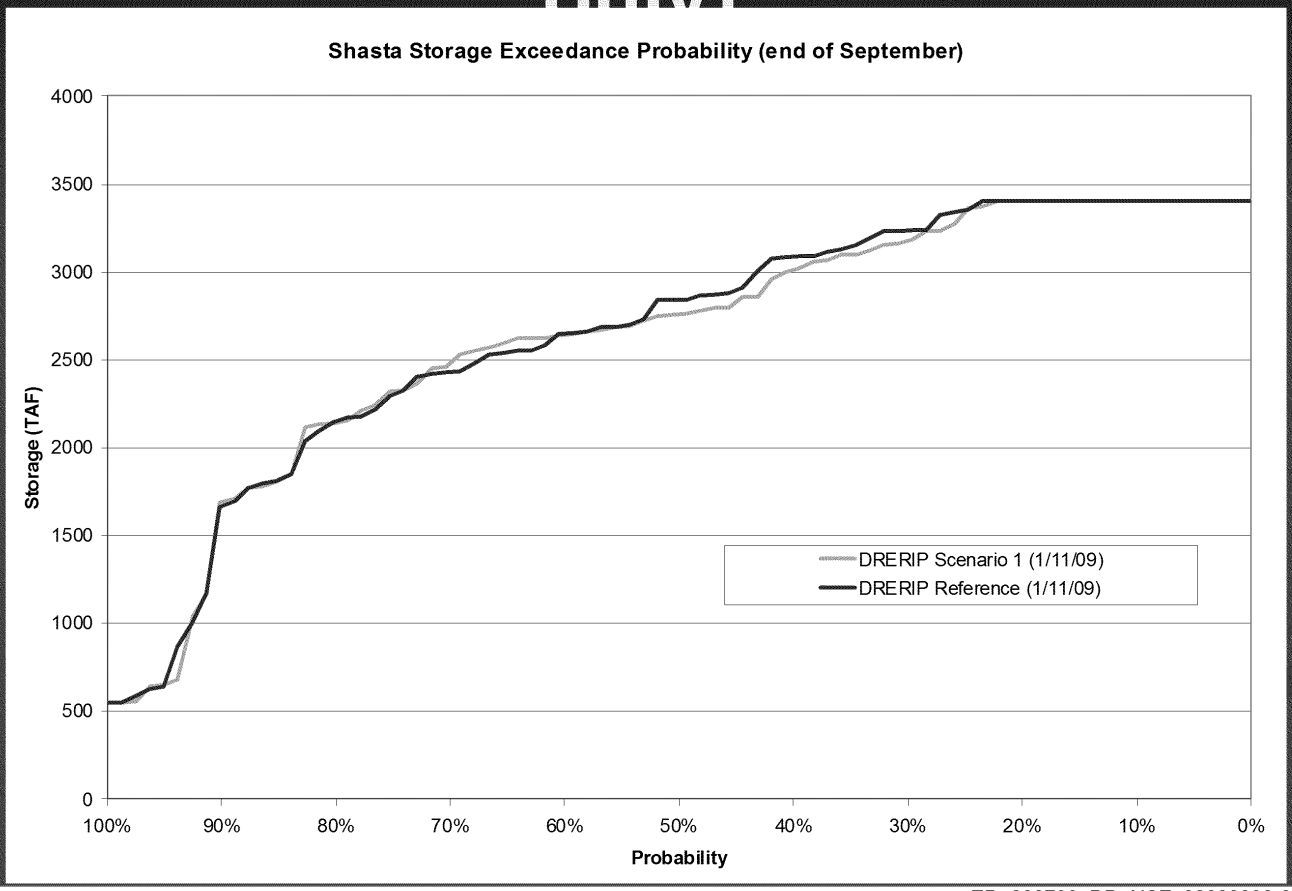
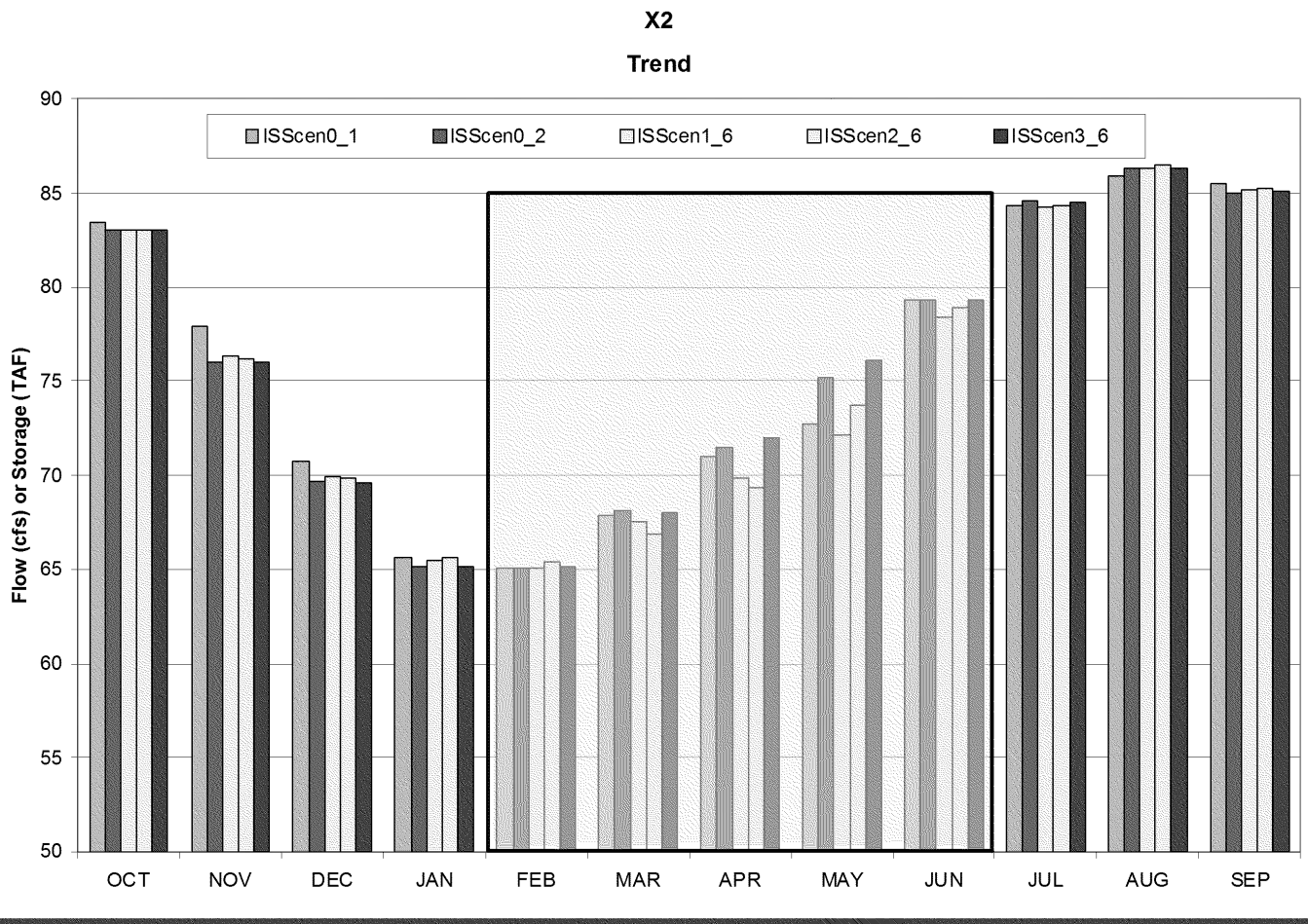
Upstream Storage (Example only)



Insert Feb-Jun X2 Plot



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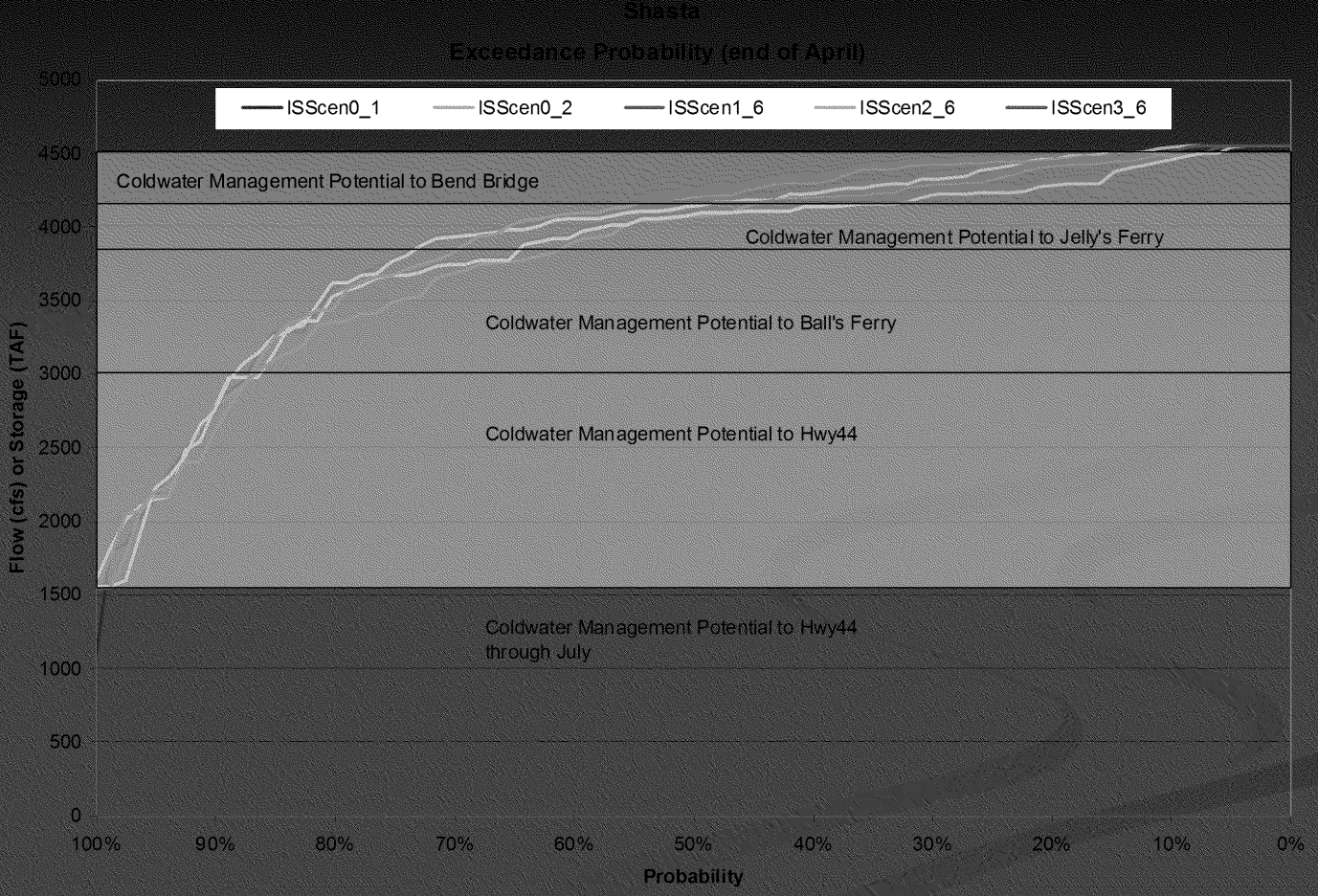

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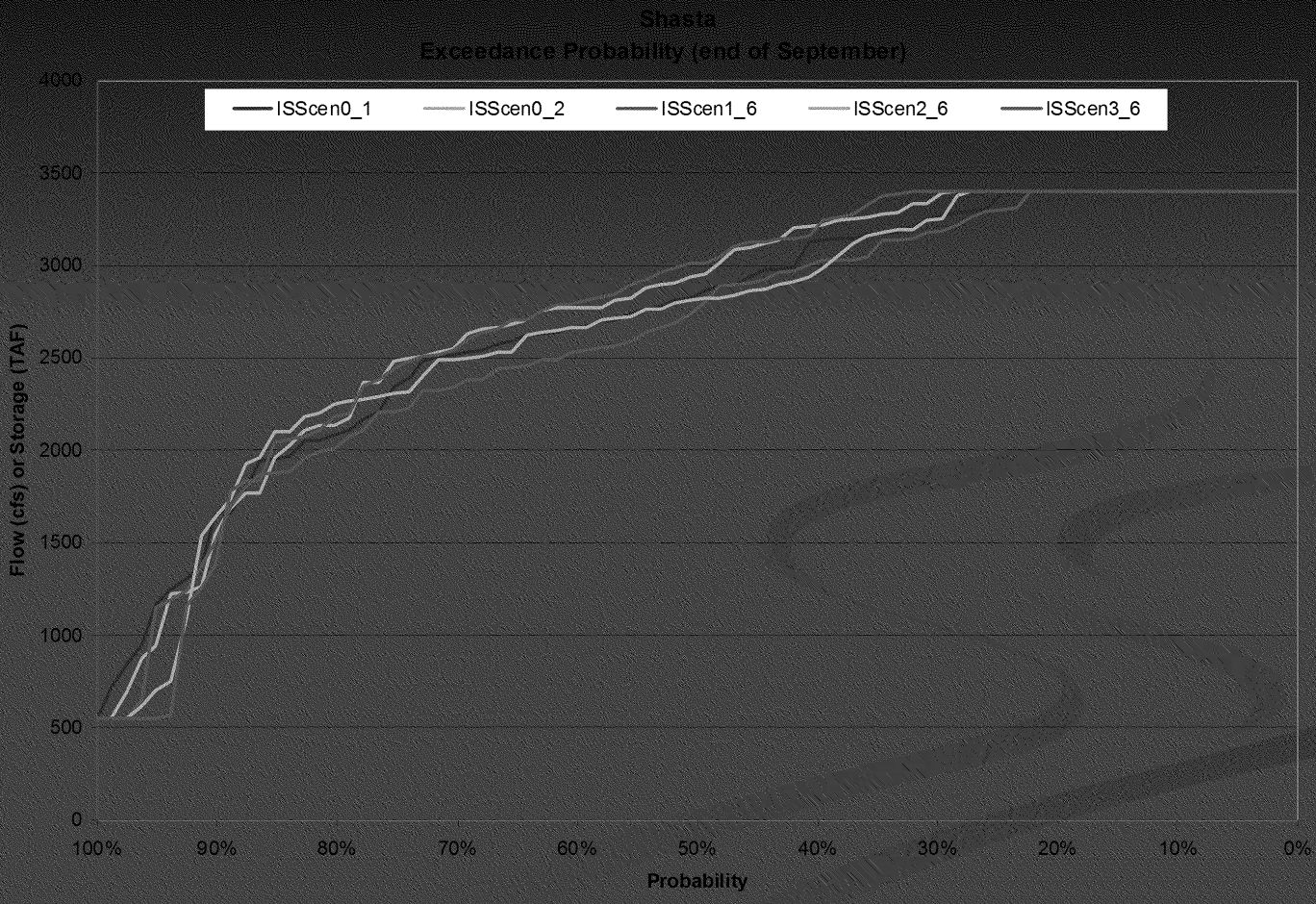
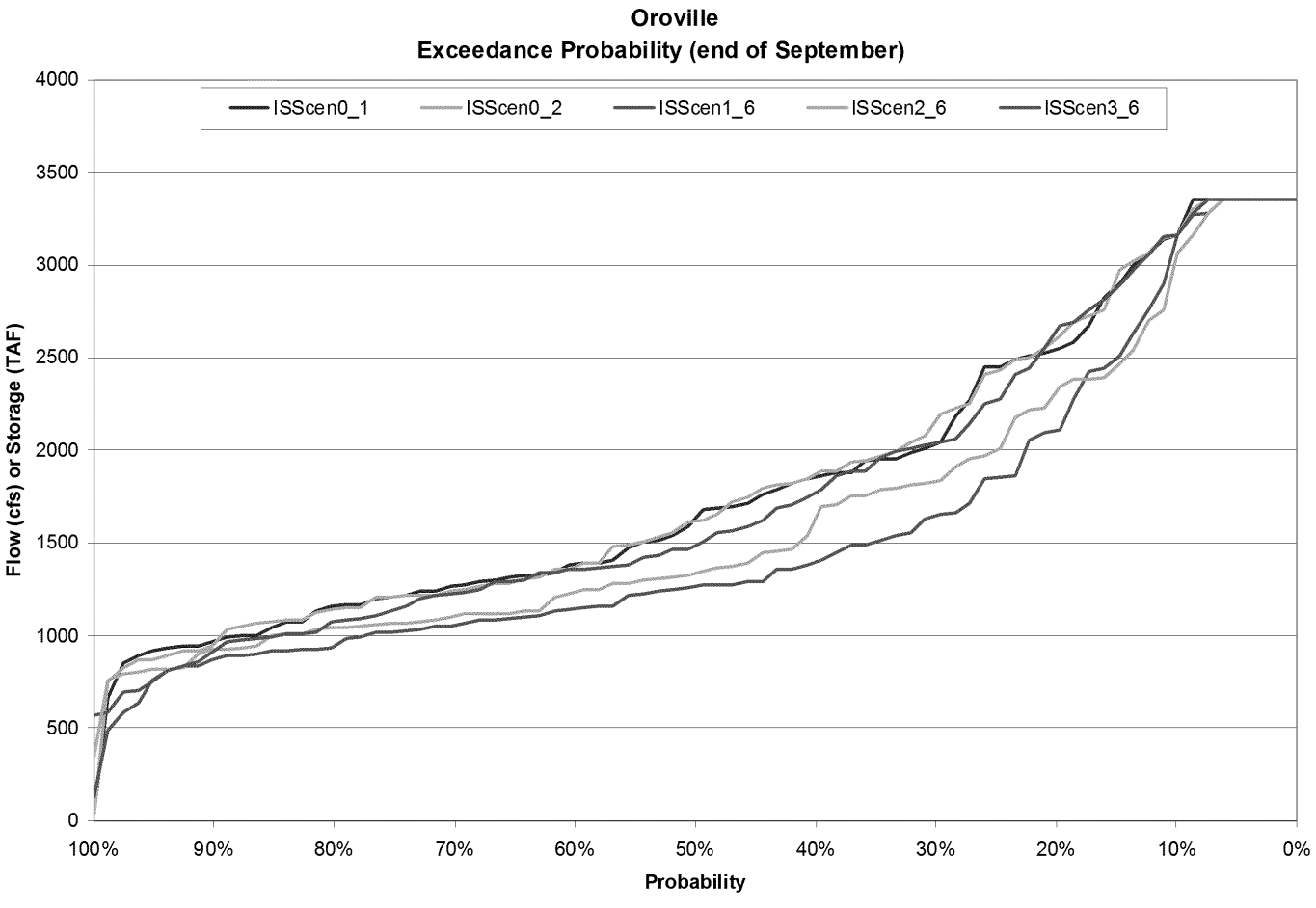
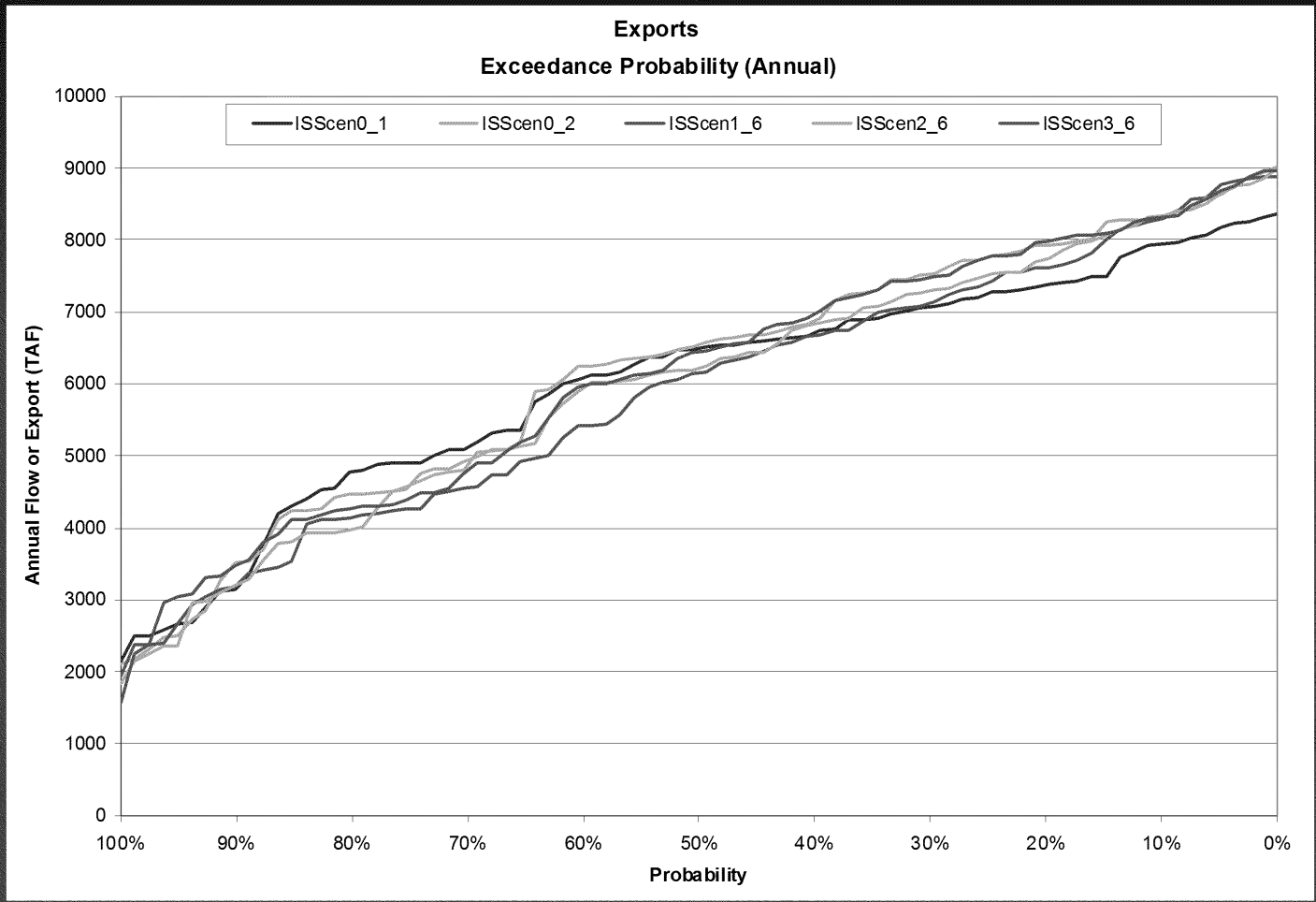
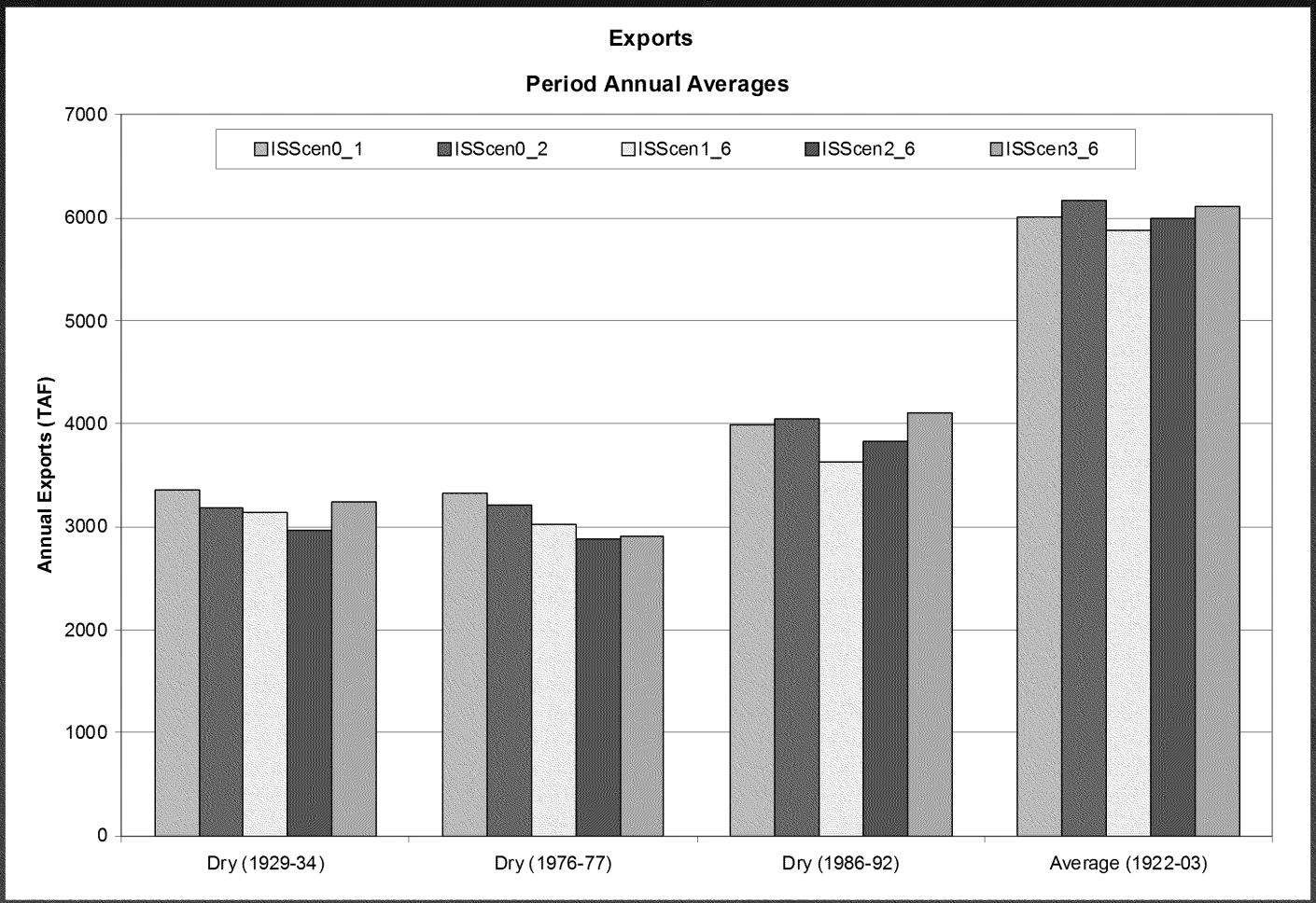



Oroville
Exceedance Probability (end of September)
ISScen0_1
ISScen0_2
ISScen1_6
ISScen2_6
ISScen3_6
Flow (cfs) or Storage (TAF)
4000
3500
3000
2500
2000
1500
1000
500
0
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Probability


Exports
Exceedance Probability (Annual)
ISScen0_1
ISScen0_2
ISScen1_6
ISScen2_6
ISScen3_6
Annual Flow or Export (TAF)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Probability


Exports
Period Annual Averages
ISScen0_1
ISScen0_2
ISScen1_6
ISScen2_6
ISScen3_6
Annual Exports (TAF)
7000
6000
5000
4000
3000
2000
1000
0
Dry (1929-34)
Dry (1976-77)
Dry (1986-92)
Average (1922-03)